Climate Characterization and Modelling of Pineapple Greenhouses in the Azores Archipelago

F.J. Baptista[a]
Universidade de Évora
Escola de Ciências e Tecnologia
Departamento de Engenharia Rural
ICAAM – Instituto de Ciências Agrárias e Ambientais Mediterrânicas
Núcleo da Mitra, Ap. 94, 7002-554 Évora
Portugal

J.F. Meneses[b]
Instituto Superior de Agronomia
Universidade Técnica de Lisboa
Centro de Engenharia dos Biossistemas
Tapada da Ajuda. 1349-017 Lisboa
Portugal

Keywords: ventilation, climate model

Abstract

In the Azores Archipelago, Portugal, pineapples are cultivated on the Island of São Miguel, existing around 60 ha of glasshouses dedicated to this crop, being a very important sector for the local economy. The main goal of this work is to characterise the Azores pineapple glasshouse climate and to develop a model that allows predicting its internal air temperature. Climate data were recorded in two meteorological stations, one located inside the greenhouse and the other outside. Greenhouse climate data showed a more favourable inside air temperature after middle of March, but reaching frequently very high values during the day in all the months analysed, which is a result of traditional greenhouse management and deficient ventilation. In these greenhouses external conditions such as external air temperature, global radiation and day length greatly influenced the climate inside the greenhouses and as a consequence the duration of the different crop phases and fruit quality. A climate model to simulate inside air temperature was developed based on glasshouse characteristics and external climate conditions such as air temperature, solar radiation, ventilation openings and wind velocity. Since most of the time ventilation apertures were closed it was considered an infiltration rate (varying between 1 and 3 air renovation) per hour, as a function of the wind velocity. Validation of the model was performed after calibration and showed good agreement.

INTRODUCTION

The pineapple crop was introduced in Azores Archipelago, in the middle of 19th century when it was necessary to replace the traditional orange crop due to considerable damages caused by *Phytophthora* sp. (Tavares and Silva, 1997). Original from Central and South America, pineapples of Azores constitute the main greenhouse pineapple plantations in Europe. Due to the importance of the cropping system and landscape value and given its distinctive quality, the "Azores Pineapple" has a Protected Designation of Origin (PDO). It is a product strongly associated with the image of the region. This paper presents a small part of a general study that is being realized under the research project "Pineapple crop in Azores: research, development and application of technologies and practices which promote competitiveness and quality of production" financed by a regional project of FEDER.

Pineapple is a plant from a tropical climate, with the most favourable temperature between 18 and 35°C (Morton, 1987). Optimal development and better fruit quality is achieved with ambient temperature between 22 and 32°C, thermal amplitude between day and night of 8 to 14°C and relative humidity higher than 70% (INOVA, 2009). The Azores archipelago is located at a latitude ranging from 36.9 to 39.7°N and is characterised by a mild, humid climate with an average temperature between 14.4 and 22°C,

[a] E-mail: fb@uevora.pt.
[b] E-mail: jmeneses@isa.utl.pt.